



Answers to Maths Quest Trial HSC July 2007

Answer sheet for Section 1

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|-------|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|
| 1. A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 2. A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |
| 3. A | <input type="radio"/> | B | <input type="radio"/> | C | <input checked="" type="radio"/> | D | <input type="radio"/> |
| 4. A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |
| 5. A | <input type="radio"/> | B | <input type="radio"/> | C | <input checked="" type="radio"/> | D | <input type="radio"/> |
| 6. A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 7. A | <input checked="" type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 8. A | <input checked="" type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 9. A | <input checked="" type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 10. A | <input checked="" type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 11. A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |
| 12. A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |
| 13. A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 14. A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |
| 15. A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 16. A | <input type="radio"/> | B | <input type="radio"/> | C | <input checked="" type="radio"/> | D | <input type="radio"/> |
| 17. A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |
| 18. A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |

19. A ☐ B ☒ C ☐ D ☐

20. A ☒ B ☐ C ☐ D ☐

21. A ☐ B ☐ C ☒ D ☐

22. A ☐ B ☐ C ☒ D ☐

Section B
Question 23

	Solution	Mks	Comments
(a)	$\text{GST} = \$407 \div 11$ $= \$37$	1	
(b) (i)	$\text{Gross pay} = 35 \times \19.40 $= \$679$	1	
(ii)	$\text{Overtime hourly rate} = \19.40×1.5 $= \$29.10$	1	
(iii)	$\text{Overtime needed} = \$1000 - \$679$ $= \$321$ $\text{Hours needed} = \$321 \div \29.10 $= 11.03$ $= 12 \text{ hours overtime}$ Alan needs to work a total of 47 hours.	2	1 mark for correct answer but not allowing for whole hours. 1 mark if student gives the number of hours overtime needed only.
(c) (i)	$I = Prn$ $= \$12\,000 \times 0.088 \times 5$ $= \$5280$	1	
(ii)	$\text{Monthly repayment} = \20.76×12 $= \$249.12$ $\text{Total repayments} = \249.12×60 $= \$14\,947.20$	2	1 mark for monthly repayment and 1 mark for total repayments
(iii)	$\text{Total repayment with simple interest loan}$ $= \$12\,000 + \5280 $= \$17\,280$ $\text{Saving} = \$17\,280 - \$14\,947.20$ $= \$2332.80$	2	1 mark for total repayments under simple interest. 1 mark for saving.
(d) (i)	Savings $= \$1750 - \$580 - \$175 - \$90 - \$280 - \$100 - \$80 - \270 $= \$175$	1	
(ii)	$\text{Fortnights needed} = \$4500 \div \$175$ $= 25.7$ $= 26 \text{ fortnights}$ It will take Bella 52 weeks to save for her holiday.	2	1 mark if no allowance made for the \$1000 saved. 1 mark if no conversion made between fortnights and weeks.

Question 24

	Solution	Mks	Comments
(a)	$270 \text{ km/hr} = 270\,000 \text{ m/hr}$ $= 4500 \text{ m/min}$ $= 75 \text{ m/sec}$	1	
(b) (i)	$\angle DOB = (360 - 311) + 45$ $= 94^\circ$	1	
(ii)	$\text{Area AOD} = \frac{1}{2} \times 26 \times 35 \times \sin 94^\circ$ $= 453.8916429 \text{ (h.c.)}$ $\approx 454 \text{ m}^2$	2	1 mark for correct working but =incorrect rounding
(iii)	$AB^2 = 26^2 + 31^2 - 2 \times 26 \times 31 \times \cos 95^\circ$ $= 1777.495057$ $AB = \sqrt{1777.495057}$ $= 42.16034935 \text{ (h.c.)}$ $\approx 42 \text{ m}$	2	1 mark for correct substitution into the cosine rule formula.
(c)	$\text{Area of curved surface} = 2\pi r^2$ $= 2 \times \pi \times 6^2$ $= 226.1946711 \text{ (h.c.)}$ $\text{Area of circular base} = \pi r^2$ $= \pi \times 6^2$ $= 113.0973355 \text{ (h.c.)}$ $\text{Total surface area} = 226.1946711 + 113.0973355$ $= 339.2920066$ $\approx 339 \text{ cm}^2$	3	1 mark surface area of curved surface 1 mark surface area of circle. 1 mark total surface area
(d) (i)	$\text{Angular distance} = 165 + 170$ $= 335^\circ$ $\text{Using } 1^\circ = 4 \text{ minutes}$ $\text{Time difference} = 335 \times 4$ $= 1340 \text{ minutes}$ $= 22 \text{ hours } 20\text{min}$ $\text{At Ship B it is 4:20 PM Tuesday}$	2	1 mark for time difference 1 mark for calculation of local time.
(ii)	$\text{Angular distance} = 15^\circ$ $\text{Using } 1^\circ = 60 \text{ M}$ $\text{Distance} = 15 \times 60$ $= 900 \text{ M}$	2	1 mark for angular distance and 1 mark for conversion to nautical miles.

Question 25

	Solution	Mks	Comments
(a) (i)	$P(P) = \frac{2}{12}$ $= \frac{1}{6}$	1	
(ii)	$P(\text{non repeating letter}) = \frac{1}{12}$	1	
(b) (i)	$P(\text{white}) = \frac{5}{12}$	1	
(ii)	$P(\text{white}) = \frac{4}{11}$	1	
(iii)	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> 1st marble 2nd marble 3rd marble </div> <p> $P(\text{at least one white}) = 1 - P(\text{BBB})$ $= 1 - \frac{7}{12} \times \frac{6}{11} \times \frac{5}{10}$ $= 1 - \frac{7}{44}$ $= \frac{37}{44}$ </p>	3	1 mark tree diagram 1 mark for complementary event 1 mark calculation.
(c) (i)	260	1	
(ii)	77	1	
(iii)	$P(\text{prof lessons but failed}) = \frac{34}{260}$ $= \frac{17}{130}$	1	
(d) (i)	$BC^2 = 51^2 \quad AC^2 + AB^2 = 24^2 + 45^2$ $= 2601 \quad = 576 + 2025$ $= 2601$ <p>As $BC^2 = AC^2 + AB^2$ this is a right-angled triangle.</p>	1	
(ii)	<p>Let $\angle ABC = \theta$</p> $\cos \theta = \frac{45}{51}$ $\theta = \cos^{-1}\left(\frac{45}{51}\right)$ $\approx 28^\circ$	2	1 mark for a trigonometric method using wrong side lengths.

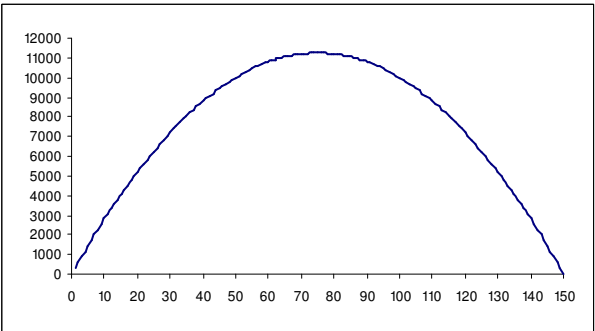
Question 26

	Solution	Mks	Comments
(a) (i)	$D = 75 - \frac{225}{A}$ $= 75 - \frac{225}{5}$ $= 30 \text{ mL}$	1	
(ii)	$D = 75 - \frac{225}{A}$ <p>At three years old</p> $D = 75 - \frac{225}{3}$ $= 0$ <p>A three year old takes 0 mL of medicine.</p>	2	1 mark for getting $D = 0$ and one for conclusion
(iii)	<p>Can take adult dose when $D = 60$</p> $75 - \frac{225}{A} = 60$ $\frac{225}{A} = 15$ $15A = 225$ $A = 15$ <p>The adult dose can be taken at 15 years of age.</p>	2	1 mark for $A = 15$ and 1 mark for conclusion.
(b) (i)	$P = 100\,000(1.05)^n \text{ when } n = 10$ $= 100\,000(1.05)^{10}$ $\approx 163\,000$	1	
(ii)	<p>Test $n = 15$</p> $P = 100\,000(1.05)^{15}$ $\approx 208\,000$ <p>Test $n = 18$</p> $P = 100\,000(1.05)^{18}$ $\approx 241\,000$ <p>Test $n = 19$</p> $P = 100\,000(1.05)^{19}$ $\approx 253\,000$ <p>The population will first pass 250 000 in 2026.</p>	2	1 mark for answer 1 mark for calculation of correct year.
(c) (i)	$P = 5n - 450$	1	
(ii)	<p>x-intercept = 90 where \$0 profit will be made. 90 people must attend the dance for the organisers to break even.</p>	1	
(iii)	<p>Using $P = 5n - 450$ when $n = 360$</p> $= 5 \times 360 - 450$ $= \$1350$	1	
(iv)	<p>To make a profit of \$2000 when 360 people attend we must solve: $2000 = 360C - 450$ where C is the ticket cost $360C = 2450$ $C = 6.805$ The tickets will need to cost \$7 each.</p>	2	

Question 27

	Solution	Mks	Comments
(a) (i)	<p>Chin ups</p> <p>Pulse rate</p>	2	1 mark for correct points and a bad scale.
(ii)	There would appear to be a strong negative correlation between the two variables.	2	1 mark for negative and 1 mark for strong.
(iii)	Because pulse rate is an indicator of fitness it could be said that this is a cause of someone with a lower pulse rate being able to complete more chin ups.	1	
(b) (i)	Any answer from 116 to 129	1	
(ii)	<p>68% of scores lie within 1 standard deviation of the mean</p> <p>95% of score are within two standard deviations of the mean.</p> <p>27% of scores lie between 1 and 2 standard deviations of the mean.</p> <p>Half of these will be greater than the mean</p> <p>There will be 13.5% of the population in the same I.Q. range as Jamie.</p>	2	<p>1 mark for knowledge of 68% and 95%</p> <p>1 mark for halving the difference recognising half of these score are above and half are below the mean.</p>
(c) (i)	11 goals was the most kicked by Anthony	1	
(ii)	<p>(α) Range = $7 - 1$ = 6</p> <p>(β) IQR = $6 - 1$ = 5</p>	1 1	
(iii)	Anthony's scores are positively skewed because they are clustered at the lower end of the data set. Travis scores are symmetrical.	2	1 mark for each response.

Question 28

	Solution	Marks	Comments																
(a)	$A \approx \frac{h}{3}(d_f + 4d_m + d_l)$ $= \frac{78}{3}(51 + 4 \times 48 + 24)$ $= 26 \times 267$ $= 6942 \text{ m}^2$	2	1 mark given if only one calculation error is made.																
(b) (i)	No. of combinations = 6C_3 $= 20$	1																	
(ii)	No. of arrangements = 7P_3 $= 210$	1																	
(iii)	If Emma and Zach both serve then arrangements $= 5 \times 3$ $= 15$ Therefore the arrangements without both serving is $210 - 15$ $= 195$	2	1 mark for calculating together 1 mark for subtraction																
(c) (i)	Length = $300 - 2x$	1																	
(ii)	$A = x(300 - 2x)$ $= 300x - 2x^2$	1																	
(iii)	<table border="1"><tr><td>x</td><td>0</td><td>20</td><td>50</td><td>75</td><td>100</td><td>125</td><td>150</td></tr><tr><td>A</td><td>0</td><td>5200</td><td>10000</td><td>11250</td><td>10000</td><td>6250</td><td>0</td></tr></table>	x	0	20	50	75	100	125	150	A	0	5200	10000	11250	10000	6250	0	2	1 mark if only one error made
x	0	20	50	75	100	125	150												
A	0	5200	10000	11250	10000	6250	0												
(iv)		2																	
(v)	Length = 150 m width = 75 m	1																	